METHOD OF MAKING A RETURN ROLLER

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application is a divisional of U.S. Patent Application No. 10/322,025 filed on December 17, 2002.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

[0002] Not Applicable.

BACKGROUND OF THE INVENTION

[0003] The field of invention is conveyor systems, and more particularly, a method of forming return rollers used in endless chain or belt conveyor systems.

[0004] An endless conveyor chain or modular belt passes over a conveyor frame from a frame tail to a frame head to convey a product, and returns to the frame head beneath the frame in an endless loop. When the conveyor chain or belt returns beneath the conveyor frame, the chain or belt must be supported to prevent the chain or belt from striking the ground or some other object beneath the conveyor frame.

[0005] Unpowered return rollers are often used to support the return portion of the chain or belt. In many cases, the return rollers are special mechanical assemblies made by pressing bearings into the ends of a polyvinyl chloride (PVC) or steel pipe. These rollers often would not turn despite the bearings which resulted in the roller being unevenly worn down by the conveyor. In addition, a plain PVC pipe slide over a metal shaft without bearings is known.

[0006] A known roller provided by Marbett Conveyor Components is coated with a high friction material, such as rubber, which engages the conveyor chain return to force the roller to rotate. This reduces the problem of uneven wear on the roller. Unfortunately, the Marbett rollers are injection molded which limits the roller length. As a result, multiple rollers are required to accommodate wide chains or belts.

[0007] Another problem associated with the return rollers is debris and dust which can be caught between the return roller and belt or chain. The debris can become embedded in the roller, belt, or chain which can cause premature wear and failure. Therefore, a need exists for an improved return roller for use in belt or chain conveyor systems.

BRIEF SUMMARY OF THE INVENTION

[0008] The present invention provides a method of making a return roller for use in a conveyor system. The method includes extruding an elongated cylindrical core defining a radially outwardly facing surface, and coextruding a coating onto the at least a portion of the radially outwardly facing surface of the core. The coating is preferably coextruded with at least one discontinuity formed in the coating to provide debris relief and indicate wear of the coating.

[0009] An objective of the present invention is to provide coated return roller which can be formed in any length. This objective is accomplished by coextruding at least the portion of the cylindrical core defining the radially outwardly facing surface with the coating.

[0010] Another objective of the present invention is to provide a return roller which is not adversely affected by debris. This objective is accomplished by forming discontinuities in the coating to provide debris relief.

[0011] The foregoing and other objectives and advantages of the invention will appear from the following description. In the description, reference is made to the accompanying drawings which form a part hereof, and in which there is shown by way of illustration a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a side view of a conveyor system incorporating the present invention;

[0013] Fig. 2 is a perspective view of the return roller of Fig. 1;

[0014] Fig. 3 is a side view of the return roller of Fig. 2;

[0015] Fig. 4 is a cross sectional view along line 4-4 of Fig. 3;

[0016] Fig. 5 is a perspective view of another embodiment of a return roller incorporating the present invention;

[0017] Fig. 6 is a perspective view of another embodiment of a partially disassembly return roller incorporating the present invention;

[0018] Fig. 7 is a cross sectional view of the roller of Fig. 6;

[0019] Fig. 8 is a perspective view of yet another embodiment of a return roller incorporating the present invention; and

[0020] Fig. 9 is a cross sectional view of another embodiment of a return roller incorporating the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] As shown in Fig. 1, a conveyor drive system 10 includes an endless conveyor belt 12 driven by a drive sprocket 14 that is rotatably coupled to drive motor 16 by a drive belt 18. The conveyor belt 12 travels over an upper support 20 between an idler sprocket 22 and the drive sprocket 14, and returns beneath the upper support 20 as it travels between the drive sprocket 14 and the idler sprocket 22. A return roller 30 supports the return section 24 of the belt 12 to support the conveyor belt 12 beneath the upper support 20 Although two return rollers 30 are shown, one or more return rollers can be provided without departing from the scope of the invention. The term belt used herein shall be construed to include chains.

[0022] Referring to Figs. 2-4, the return roller 30 includes an extruded roller core 32 on which a coating 34 is coextruded. Advantageously, by coextruding the coating over the cylindrical core, the roller can be formed having any length desired or formed having a standard length which can be cut to the desired length. In preferred embodiments described below, the coating 34 includes at least one discontinuity 36 which can provide debris relief or indicate wear that requires roller 30 replacement.

[0023] The roller core 32 shown in Figs 2-4 is formed from a rigid material, such as glass reinforced polypropylene, or other thermoplastic material including PVC, and includes an outer cylindrical shell 38 joined to an inner cylindrical shell 40 by spokes 42 extending radially between the shells 38, 40. The outer cylindrical shell 38 defines a

substantially continuous radially outwardly facing surface 44. Although three spokes 42 is preferred to provide sufficient support for the outer cylindrical shell 38 with a minimum use of material, any number of spokes can be provided without departing from the scope of the invention. In this embodiment, the roller core 32 is formed as a single piece, however, as described below, the roller core 32 can be an assembly formed from separately formed parts without departing from the scope of the invention.

[0024] The coating 34 is coextruded onto the radially outwardly facing surface 44 of the outer cylindrical shell 38. Preferably, the coating 34 is a thermoplastic rubber or urethane that has a high coefficient of friction compared to the core 32, such that the interaction between the return section 24 and the roller 30 will cause the roller to spin and prevent uneven wear. In certain applications, however, it may be advantageous to use a hard, wear resistant material for the coating 34, such as PVC, polyamide, acetal (POM), or polybutylene terephthalate (PBT) in abrasive environments.

[0025] Preferably, the coating 34 chemically bonds with the roller core 32 to fix the coating 34 relative to the core 32. Although chemically bonding the coating 34 to the roller core 32 is preferred, materials can be used which do not chemically bond, or only form a weak chemical bond, without departing from the scope of the invention. If the coating 34 does not chemically bond to the roller core 32, the coating 34 can be fixed to the roller core 32 using a shrink fit, a mechanical bond, and other methods known in the art without departing from the scope of the invention.

[0026] The plurality of axially extending, radially spaced discontinuities 36 are formed in the coating 34 for debris relief. The discontinuities 36 provides a space for

debris disposed between the roller 30 and conveyor belt 12, such that the debris is not pressed into the conveyor belt 12 or roller 30 and can fall harmlessly to the ground as the roller 30 rotates. Advantageously, the discontinuities 36 can also function as wear indicators to provide maintenance personal with notice that the roller 30 needs replacement. Although a plurality of discontinuities 36 is preferred, one or more discontinuities 36 can be provided without departing from the scope of the invention. In the embodiment disclosed in Figs. 2-4, the discontinuities 36 do not extend the entire depth of the coating 34, however, as disclosed below, the discontinuities 36 can be formed by applying the coating in axially extending strips on the radially outwardly facing surface 44 of the cylindrical core 32 exposing portions of the cylindrical core 32.

[0027] The roller 30 rotates on a shaft 46 (shown in Fig. 1) extending through the inner cylindrical shell 40. The shaft 46 can be fixed at both ends, such that it does not rotate. In this case, brass bushings (not shown) can be provided to increase wear resistance. The brass bushings can be provided at the ends of inner cylindrical shell 40 or the roller core 32 can be extruded over a brass bushing extending the entire length of the inner surface 48 of the inner cylindrical shell 40. Although a single shaft extending through the roller is preferred in certain application, short shafts inserted into each end of the roller may be preferred if the roller core is sufficiently rigid to support the load imposed on the roller by the return belt.

[0028] In applications where no relative movement between the shaft 46 and roller 30 is desired, the shaft 46 can be rotatably mounted using bearings (not shown), such that the roller 30 can rotate with the shaft 46. In this application, the roller 30 can be fixed to

the rotating shaft using a key, square shaft in a square bore, or by bonding the roller to the shaft using adhesives, fasteners, and the like.

[0029] In an alternative embodiment disclosed in Figs. 5, a return roller 50 includes a roller core 52 having an inner cylindrical shell 54. Spokes 56 extending radially outwardly from the inner cylindrical shell 54 have distal ends 58. The distal ends 58 define a discontinuous radially outwardly facing surface 60. A coating 62, a such as described above, is chemically bonded to the spoke distal ends 58 for engagement with the return belt 24. Discontinuities 64 in the coating 62 are formed between the spokes 56, and correspond to discontinuities in the radially outwardly facing surface 60, to provide debris relief.

[0030] In another alternative embodiment disclosed in Figs. 6 and 7, a return roller 70 includes an multipart roller core 72. The roller core 72 is an assembly having an inner cylindrical shell 74 including radially outwardly extending spokes 76 having distal ends 78. The spoke distal ends 78 are received in grooves 80 formed in a radially inwardly facing surface 82 of an extruded outer cylindrical shell 84. Of course, the spokes 76 can be fixed to the outer cylindrical shell 84 using methods known in the art, such as a friction fit, adhesives, and the like without departing from the scope of the invention.

[0031] A coating 86, such as described above, is coextruded onto a radially outwardly facing surface 88 of the outer cylindrical shell 84 in the form of axially extending strips. Axially extending discontinuities 90 formed between the strips of coating 86 expose the radially outwardly facing surface 88 of the outer cylindrical shell 84.

[0032] In yet another embodiment disclosed in Fig. 8, an end cap 92 is provided over each end 94 of a cylindrical core 96, such as described above, to prevent debris and dust from collecting between the spokes 98. Arms 100 extending axially from the cap 92 extend into the cylindrical core 96 to provide a snap fit that holds the cap 92 over the core end 94. Of course, other methods for joining the end cap 92 to the cylindrical 96 core can be used, such as adhesives, fasteners, and the like, without departing from the scope of the invention. Advantageously, the end caps 92 can extend radially past the coating to form flanges which can act as guides to keep the belt in contact with the roller.

[0033] In yet another alternative embodiment disclosed in Fig. 9, the cylindrical core 102 has an inner cylindrical shell 104 formed with a radially inwardly facing surface 106 having a square cross section. Advantageously, the non-circular cross section can be provided when no relative movement between the shaft and roller is desired.

[0034] While there have been shown and described what is at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the scope of the invention defined by the appended claims.